

SALT LAKE COMMUNITY COLLEGE  
MATH 1060 - TRIGONOMETRY  
FINAL EXAMINATION

**Fall 2005 Version K**

Name \_\_\_\_\_

section \_\_\_\_\_

This exam is closed book without notes. Calculator usage is restricted to scientific and graphing calculator technology.

Problems 1 – 12 are multiple choice. Circle the answer you think is correct. Problems are either right or wrong; there is no partial credit. There is no penalty for marking a wrong answer.

Problems 13 – 20 are problems to work out for full credit, and then circle your answer to identify it clearly. Partial credit is awarded for the correct work shown.

Choose four (4) of the problems from 21 to 28. Show all your work for full credit. Partial credit can be awarded.

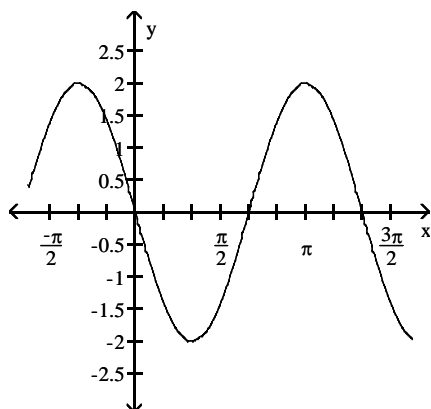
Cross out the four problems that you do not want to be graded.

You will be graded on the first twenty-four (24) problems you show.

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**Find an equation for the graph.**

1)



A)  $y = -2 \sin \left( \frac{3}{2}x + \frac{\pi}{2} \right)$

C)  $y = 2 \cos \left( \frac{3}{2}x + \frac{\pi}{2} \right)$

B)  $y = 2 \cos \left( \frac{2}{3}x - \frac{\pi}{2} \right)$

D)  $y = 2 \sin \left( \frac{2}{3}x - \frac{\pi}{2} \right)$

Find the missing parts of the triangle.

2)  $\beta = 14.5^\circ$   
 $b = 3.79$   
 $a = 5.05$

A)  $\alpha = 19.49^\circ$ ,  $\gamma = 146.01^\circ$ ,  $c = 8.46$

B)  $\alpha = 19.49^\circ$ ,  $\gamma = 146.01^\circ$ ,  $c = 8.46$ ;  
 $\alpha' = 160.51^\circ$ ,  $\gamma' = 4.99^\circ$ ,  $c' = 1.32$

C)  $\alpha = 160.51^\circ$ ,  $\gamma = 4.99^\circ$ ,  $c = 1.32$

D) No solution

Find the exact value by using a sum or difference identity.

3)  $\cos 195^\circ$

A)  $\frac{\sqrt{2}(\sqrt{3} - 1)}{4}$

B)  $\frac{-\sqrt{2}(\sqrt{3} + 1)}{4}$

C)  $\frac{-\sqrt{2}(\sqrt{3} - 1)}{4}$

D)  $\frac{\sqrt{2}(\sqrt{3} + 1)}{4}$

Find the missing parts of the triangle.

4)  $\alpha = 35.0^\circ$   
 $b = 16.9$  cm  
 $c = 19.6$  cm

A)  $a = 11.3$  cm,  $\beta = 59.3^\circ$ ,  $\gamma = 85.7^\circ$

B)  $a = 11.3$  cm,  $\beta = 50.7^\circ$ ,  $\gamma = 94.3^\circ$

C)  $a_1 = 11.3$  cm,  $\beta_1 = 59.3^\circ$ ,  $\gamma_1 = 85.7^\circ$   
 $a_2 = 9.8$  cm,  $\beta_2 = 50.7^\circ$ ,  $\gamma_2 = 94.3^\circ$

D) No triangle satisfies the given conditions.

Find the power. Write answer in the standard form,  $a + bi$ .

5)  $[2(\cos 15^\circ + i \sin 15^\circ)]^4$

A)  $16\sqrt{2} + 16\sqrt{2}i$

B)  $-8\sqrt{2} - 8\sqrt{2}i$

C)  $-8 - 8\sqrt{3}i$

D)  $8 + 8\sqrt{3}i$

Find the exact value of the expression.

6)  $\cot\left(\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)\right)$

A)  $\frac{\sqrt{3}}{3}$

B)  $-\frac{\sqrt{3}}{3}$

C)  $\sqrt{3}$

D)  $-\sqrt{3}$

**Find the center and vertices of the ellipse.**

7) Determine the center and vertices for the following ellipse:

$$9x^2 + 16y^2 + 18x - 64y = 71$$

A) center:  $(-1, 2)$

vertices:  $(-5, 2)$   $(3, 2)$

B) center:  $(-1, 2)$

vertices:  $(-1, 5)$   $(-1, -1)$

C) center:  $(1, -2)$

vertices:  $(-4, -2)$   $(6, -2)$

D) center:  $(1, -2)$

vertices:  $(1, -5)$   $(1, 1)$

**Solve the right triangle. Round answers to one decimal place.**

8)  $a = 8.6$  m,  $\beta = 36.3^\circ$

A)  $\alpha = 53.7^\circ$ ,  $b = 11.7$  m,  $c = 14.5$  m

B)  $\alpha = 53.7^\circ$ ,  $b = 6.3$  m,  $c = 10.7$  m

C)  $\alpha = 53.7^\circ$ ,  $b = 10.7$  m,  $c = 11.7$  m

D)  $\alpha = 53.7^\circ$ ,  $b = 7.9$  m,  $c = 11.7$  m

**Complete the identity.**

9)  $\frac{1 + \tan \theta}{1 + \cot \theta} = ?$

A)  $\sin \theta$

B) 1

C)  $\tan \theta$

D)  $\cot \theta$

**In the problem,  $t$  is a real number and  $P=(x,y)$  is the point on the unit circle that corresponds to  $t$ . Find the exact value of the given trigonometric function.**

10)  $P = \left( \frac{5}{\sqrt{34}}, \frac{-3}{\sqrt{34}} \right)$ ; find  $\csc t$

A)  $\frac{\sqrt{34}}{5}$

B)  $-\frac{\sqrt{34}}{3}$

C)  $-\frac{5}{3}$

D)  $\frac{5}{3}$

**Solve the equation for solutions in the interval  $0 \leq \theta < 2\pi$ .**

11)  $3 \cos \theta + 3 = 2 \sin^2 \theta$

A)  $\theta = \frac{2\pi}{3}, \frac{4\pi}{3}, \pi$

B)  $\theta = \frac{\pi}{3}, \frac{5\pi}{3}, 0$

C)  $\theta = \frac{\pi}{3}, \frac{2\pi}{3}$

D) There is no solution.

**Find the angle  $\theta$  between vector  $\mathbf{u}$  and  $\mathbf{v}$ .**

12) Vector  $\mathbf{u} = 3\mathbf{i} - \mathbf{j}$  and vector  $\mathbf{v} = -\mathbf{i} + 3\mathbf{j}$ .

- A)  $53.1^\circ$
- B)  $126.9^\circ$
- C) Vectors are parallel.
- D) Vectors are perpendicular.

**Show all your work for full credit. Partial credit awarded for correct work.**

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**Solve the problem.**

- 13) The cable of a suspension bridge hangs in the form of a parabola when the load is uniformly distributed horizontally. The distance between two towers is 300 yards, the points of support of the cable on the towers are 40 yards above the roadway, and the lowest point on the cable is 2 yards above the roadway. Find the vertical distance to the cable from the roadway at a point 10 yards from the foot of a tower.

**Find the exact value by using a half-angle identity.**

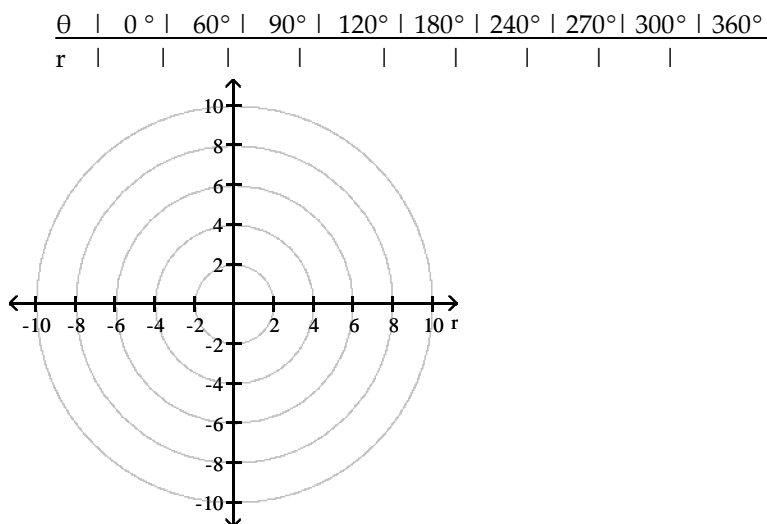
14)  $\sin 165^\circ = \sin \frac{330^\circ}{2}$

**Solve the problem.**

- 15) A wagon, with wheels of radius 2.2 ft, is moving forward at 10 ft/sec. How fast, in radians per sec, is the wheel rotating?

**Graph the polar equation.**

- 16) Complete the table of values and graph  $r = 4 - 6 \cos \theta$



**Solve the problem.**

- 17) A twenty-five foot ladder just reaches the top of a house and forms an angle of  $41.5^\circ$  with the wall of the house. How tall is the house? Round your answer to the nearest 0.1 foot.

**Establish the identity.**

18) 
$$\frac{\sin \theta}{\sin \theta - \cos \theta} = \frac{-1}{\cot \theta - 1}$$

**Solve the problem.**

- 19) A wagon with a rope tied to it is pulled horizontally by exerting a force of 60 pounds at an angle of  $25^\circ$  with the horizontal. To the nearest tenth of a foot-pound, how much work is done in moving the wagon 50 feet horizontally?

20) Write an equation of a sine function that has an amplitude of 1.5, a period of 4, and a phase shift of  $\frac{1}{2}$ .

**Choose four (4) of the last eight (8) problems to work out. Cross out the four (4) not to be counted.**

**Find the exact value of the expression.**

21) Find  $\sin(\alpha - \beta)$  when  $\tan \alpha = \frac{5}{12}$ ,  $\pi < \alpha < \frac{3\pi}{2}$ ; and  $\sin \beta = \frac{-1}{4}$ ,  $\pi < \beta < \frac{3\pi}{2}$ .

**Find the center, vertices, foci, and asymptotes of the hyperbola.**

22)  $x^2 - 9y^2 - 2x - 54y - 71 = 0$

**Solve the problem.**

23) If  $\tan \theta = -5$ , find the value of  $\tan(\theta + \pi) + \tan(\theta - \pi)$ .

**Find the exact value of the expression under the given conditions.**

24) Find the exact value of  $\cos 2\beta$  if  $\tan \beta = -\frac{4}{3}$  and  $\beta$  lies in quadrant IV.

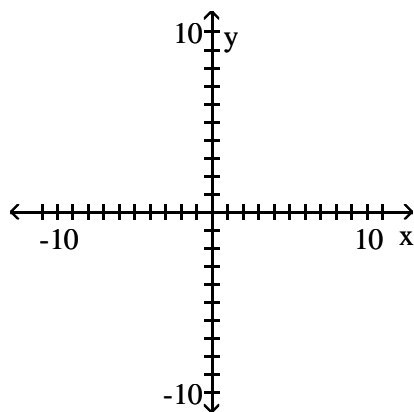
**Solve the problem.**

- 25) An object is traveling around a circle whose radius is 5 meters. If it takes 45 seconds to make one revolution, what is the angular speed  $\omega$  in revolutions per minute, and what is the linear speed  $v$  in meters per minute?

**Find a rectangular equation for the plane curve defined by the parametric equations, complete the table of values, and graph the curve.**

26)  $x = t^2 - 2$ ,  $y = t^3 - 3$ , for  $-2 \leq t \leq 2$

$t$	-2	-1	0	1	2
$x$					
$y$					



**Solve the problem.**

- 27) A loading ramp 10 feet long makes an angle of  $18^\circ$ . The angle is too steep, so it is going to be replaced by another ramp reaching the same height that makes an angle of only  $12^\circ$ . Find the length of the new ramp.

**Solve the equation for solutions in the interval  $0 \leq \theta < 2\pi$ .**

28)  $\cos 2\theta = \sin \theta$

# Answer Key

Testname: 1060-042 FINAL

1) C

2) B

3) B

4) A

5) D

6) D

7) A

8) B

9) C

10) B

11) A

12) B

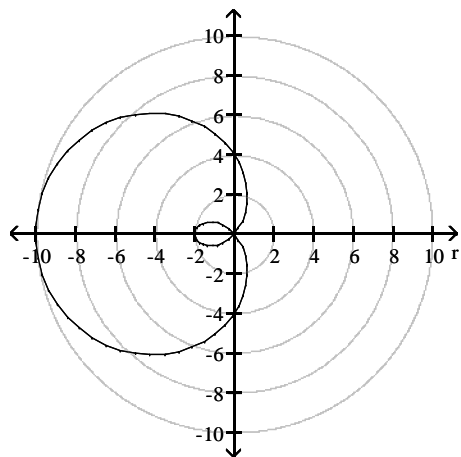
13) 35.1 yards

14)  $\frac{1}{2} \sqrt{2 - \sqrt{3}}$

15) 4.5 radians/sec

16)

$\theta$	0°	60°	90°	120°	180°	240°	270°	300°	360°
r	-2	1	4	7	10	7	4	1	-2



17) 18.7 ft

$$18) \text{ e.g. } \frac{\sin \theta}{\sin \theta - \cos \theta} = \frac{\sin \theta \times \frac{-1}{\sin \theta}}{(\sin \theta - \cos \theta) \times \frac{-1}{\sin \theta}} = \frac{-1}{-1 + \cot \theta}$$

19)  $3000 \cos(25^\circ) \approx 2718.9$  foot-pounds

$$20) y = 1.5 \sin \left[ \frac{\pi}{2} \left( x - \frac{1}{2} \right) \right] = 1.5 \sin (0.5 \pi x - 0.25 \pi)$$

$$21) \frac{5\sqrt{15}-12}{52}$$

22) Center at (1, -3), vertices at (1, -2) and (1, -4),

foci at  $(1, -3 \pm \sqrt{10})$ , asymptotes of  $y + 3 = \pm \frac{1}{3} (x - 1)$

23) -10



# Answer Key

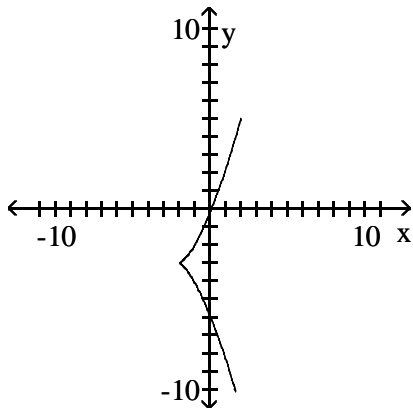
Testname: 1060-042 FINAL

$$24) -\frac{7}{25} = -0.28$$

$$25) \omega = \frac{4}{3} \text{ rpm}, v = \frac{40\pi}{3} \frac{\text{m}}{\text{min}} \approx 42 \text{ meter per minute}$$

$$26) y = \pm(x+2)^{\frac{3}{2}} - 3 \quad \text{OR} \quad x = (y+3)^{\frac{2}{3}} - 2$$

(Don't forget the direction arrows on graph.)



$$27) 14.9 \text{ meters}$$

$$28) \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$$

$t$	$-2$	$-1$	$0$	$1$	$2$
$x$	$2$	$-1$	$-2$	$-1$	$2$
$y$	$-11$	$-4$	$-3$	$-2$	$5$